

Introduction

By Mizuki Matsunuma and Hiroyuki Motomura

The South China Sea lies in the tropical zone of the western Pacific Ocean, off the southeast corner of the Asian continent, and is known for both its high productivity and the rich diversity of plants and animals. Randall and Lim (2000) listed at least 3,365 species of marine fishes from the South China Sea. Recently, several pictorial books of fishes in Malaysian waters were published. Mohsin and Ambak (1996) reported 710 species of marine fishes from Malaysian waters and adjacent seas. Adrim et al. (2004) recorded 430 marine fish species from the Anambas and Natuna islands on the Sunda Shelf between the Malay Peninsula and Borneo in the South China Sea. More recently, Ambak et al. (2010) estimated 2,243 fish species occurring in Malaysian waters.

Terengganu, a State of Malaysia, is located on the east coast of the Malay Peninsula and faced to the South China Sea. The coastal environment of Terengganu is characterized by having long sandy beaches with only a few rocky or coral reefs. This is because it is strongly influenced by the large amount of fresh water discharge from two large rivers, e.g., the Terengganu and Dungun rivers. These rivers have wide estuaries with mud flats and mangroves. In particular for coral reefs, these ecosystems are well developed on islands, i.e., Bidong and Redang islands, which are distant from the influences of river discharge, turbidity, and siltation. These marine and coastal habitats are a vital support for a vast variety of marine and estuarine biota, including fishes.

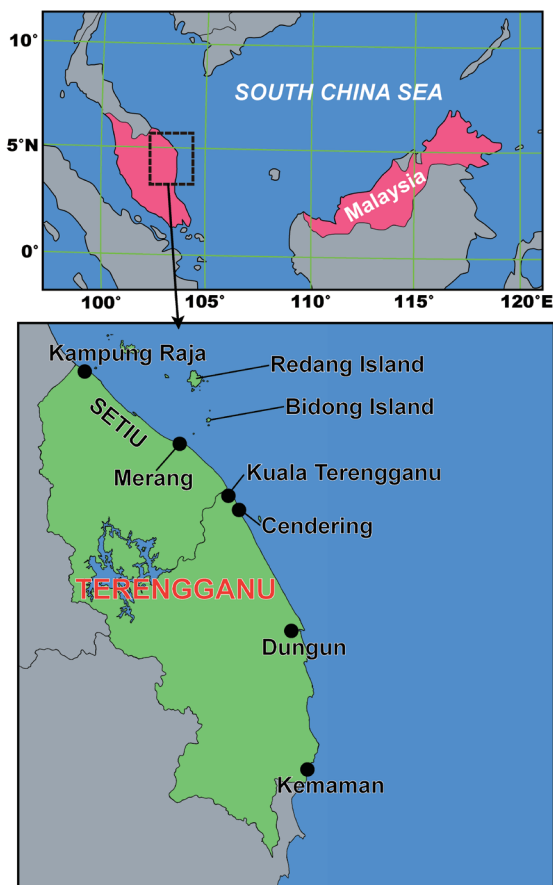
We carried out field surveys of fishes in Terengganu in 2008–2009 to produce a field guide for marine and estuarine fishes of the area. As a result of the surveys, 441 marine and estuarine fish species of 108 families were recorded. They make up around 13 % of over 3,365 fish species recorded by Randall and Lim (2000) from the South China Sea. Among these, four species including *Dasyatis parvonigra* Last & White, 2008 (family *Dasyatidae*), *Larimichthys crocea* (Richardson, 1846) (Sciaenidae), *Iniistius trivittatus* (Randall & Cornish, 2000) and *Leptojulis lambda* Randall & Ferraris, 1981 (Labridae) are recorded for the first time in the east coast of the Malay Peninsula [the latter two species were reported by Matsunuma et al. (2011)]. This book is produced based on the above surveys and cover most of the diversity of coastal fishes occurring in marine and estuarine habitats, and commercial fishes available at fish markets and ports in Terengganu. Species reported in this book are based on the collected specimens and are deposited in the South China Sea Natural History Museum at Institute of Oceanography, Universiti Malaysia Terengganu and the Kagoshima University Museum to make them available for future scientific studies. We intend this book to be useful for the study and research of ichthyology and fishery science by researchers, students and local government administrators.

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the National Museum of Nature and Science (NSMT), and the Kagoshima University Museum (KAUM).

Collection Sites

Surveys of fishes in Terengganu were made during two periods from 2008 to 2009. The first survey, carried out from September to November 2008, mainly focused on fishes inhabiting shallow coastal waters of coral or rocky reefs, mangroves, and estuaries. The collection of fishes in the survey was made at several localities in Terengganu, including Bidong Island, Setiu, Merang, Cendering, Dungun, and Kemaman. Coral and rocky reef associated fishes were obtained at Bidong Island. Fishes occurring in mangrove-lined estuary were obtained in Setiu. Cendering, located just south of Kuala Terengganu, has rocky coasts; shallow water fishes found in tide pools were collected here. Fishes were also caught at the beaches and estuaries near Universiti Malaysia Terengganu and at Merang, Dungun, and Kemaman. Fishes were collected mainly by using hand-net and fence-net while SCUBA diving or snorkeling. Cast-net, small bottom trawl, and gill nets were also used for collecting in estuaries and mangroves.



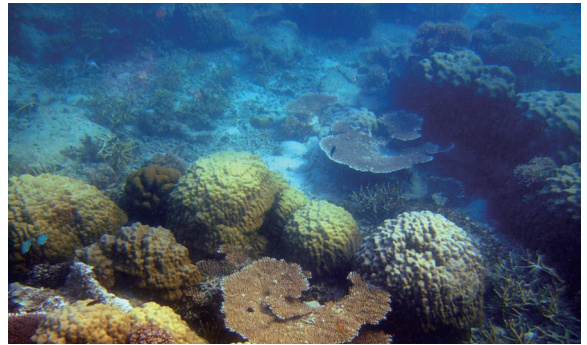
Collection Sites

The second survey observed from December 2008 to January 2009, highlighted fishes in commercial catches, obviously by trawlers, at the port or those of artisanal fisheries (mainly by traps, hand lines, and gill nets) sold at local fish markets in Kuala Terengganu and Kampung Raja. A small number of fishes captured around Redang Island were obtained from a fishing port at Kampung Raja.

The systematic arrangement of families generally follows Nelson (2006). Species in families are arranged in alphabetical order by species name. Each species record was compiled from voucher specimens. Records of the Zebra Shark (*Stegostomatidae*), *Stegostoma fasciatum* (Hermann, 1783), and the Blotched Fantail Stingray (*Dasyatidae*), *Taeniurops meyeri* (Müller & Henle, 1841), are based on photographs; these photographs are cataloged at the Fish Image Database of Kagoshima University Museum (KAUM-II). On figure legends of photographs of fish specimens which were obtained at ports or fish markets during the second survey, sampling localities are shown as “off Terengganu”; “KT” and “KR” in parentheses indicates the specimens were obtained in Kuala Terengganu and Kampung Raja, respectively. Specimens obtained during the surveys are deposited at the South China Sea Natural History Museum at Institute of Oceanography, Universiti Malaysia Terengganu (UMTF), Malaysia and the Kagoshima University Museum (KAUM), Japan.



Bidong Island



Coral reefs around Bidong Island



Fish market in Kuala Terengganu



Mangroves at Setiu



Fish landing port in Kuala Terengganu



Cast netting in estuary at Setiu

Methods of Measurements and Counts

Methods of measurements and counts generally follow Nakabo (2002). For fin formulae, the number of spinous and soft fin rays are described by Roman numerals (I, II, III,), and Arabic numerals (1, 2, 3,), respectively. The unbranched soft rays are sometimes expressed in small Roman numerals (i, ii, iii,). Spinous fin rays are generally called spines. In the case of the dorsal or anal (sometimes pectoral or pelvic) fins containing spine and soft rays, the number of spines and soft rays are separated by a comma. When the dorsal (or anal) fin consists of two or more fins (i.e. first dorsal fin, second dorsal fin,), each fin is separated by a "+" sign. Gill rakers on the first gill arch on the right side of the body are used for counting. Number of gill rakers on the upper and lower limbs are separated by a "+" sign. When present, the one or more gill rakers between the limbs are included in the lower limb counts. Number of vertebrae includes the urostyle. Counts of abdominal and caudal vertebrae are separated by a "+" sign.

A – number of anal-fin rays.

BR – number of branchiostegal rays

D – number of dorsal-fin rays.

DW – disc width: extremities of the left and right pectoral fins.

DPC – number of dorsal procurent caudal-fin rays.

FL – fork length: linear distance from most anterior point of head to bottom of concave margin of caudal fin.

GR – number of gill rakers.

LGR – number of gill rakers on lower limb.

LL – number of lateral line scales: number of scales on lateral line from the scale behind the posttemporal to the caudal-fin base.

LLp – number of pored scales on lateral line: only the number of pored scales on lateral line is counted.

LR – number of scales in longitudinal row: number of scales in longitudinal row from the dorsal end of the opercular membrane to the caudal-fin base.

MP – number of mandibular pores.

P₁ – number of pectoral-fin rays.

P₂ – number of pelvic-fin rays.

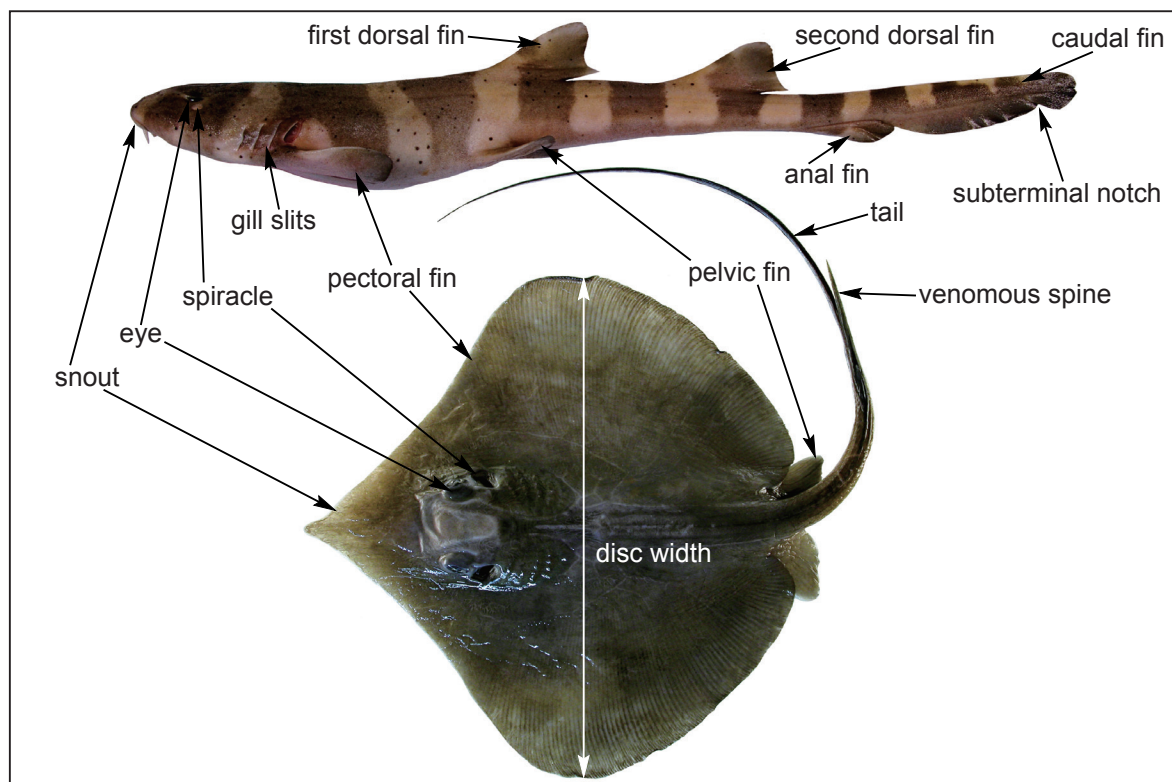
PDS – number of predorsal scales: number of scales on the dorsal midline from the origin of dorsal fin forward to occipital region.

PLp – preanal lateral-line pores: number of pores along lateral line behind gill opening to just above the anus.

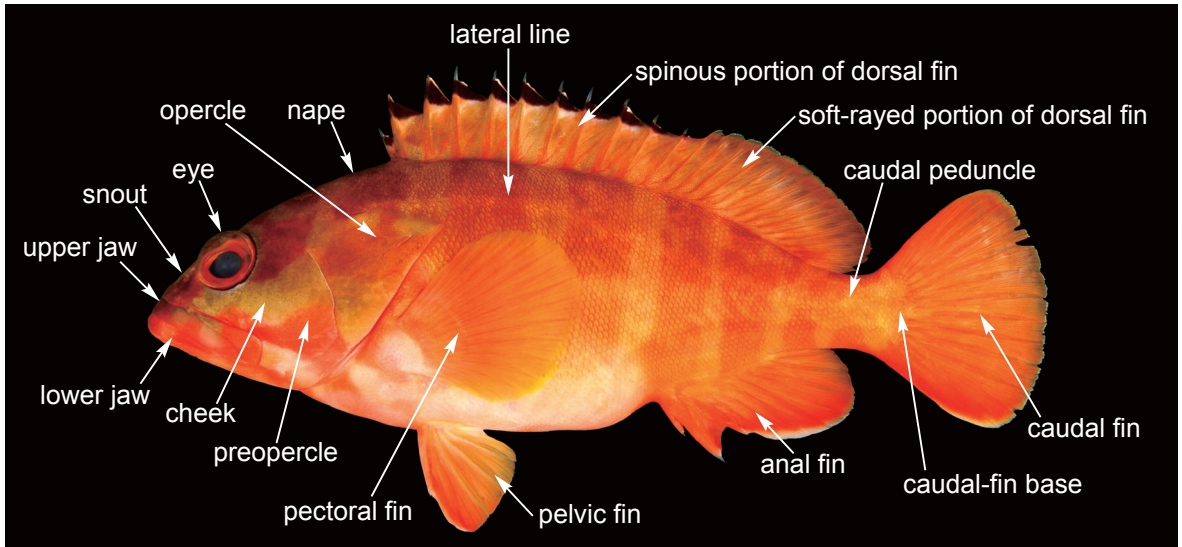
SL – standard length: linear distance from most anterior point of upper jaw (or snout) with mouth closed to caudal fin base (posterior end of hypurals, roughly where fold formed by bending caudal fin).

TL – total length: greatest linear distance between most anteriorly projecting part of head with mouth closed and farthest tip of caudal fin when caudal rays squeezed together. All unspecified lengths are assumed to be total lengths.

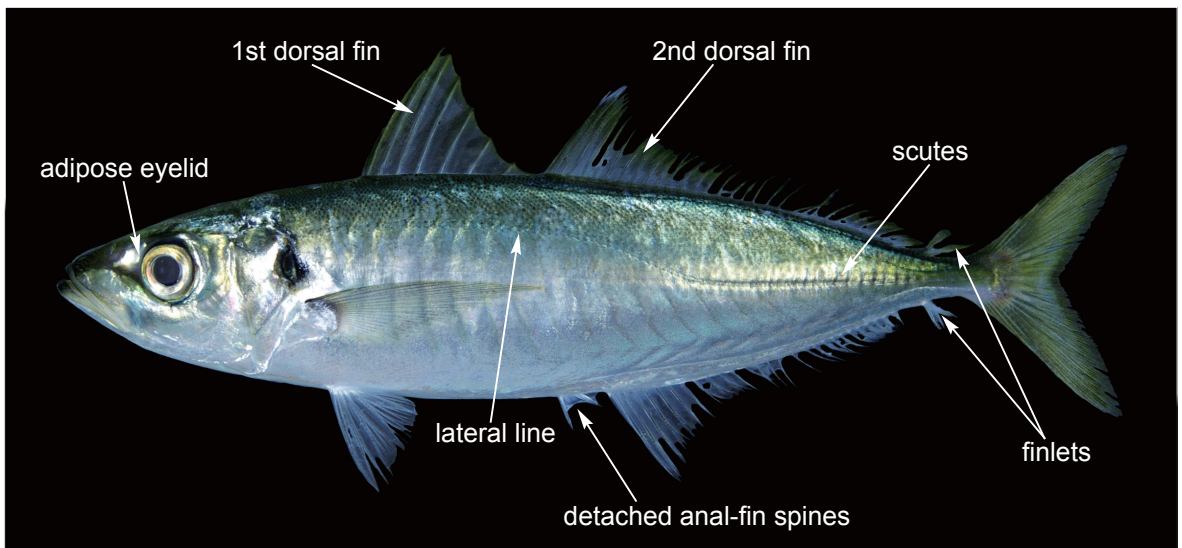
V – number of vertebrae.



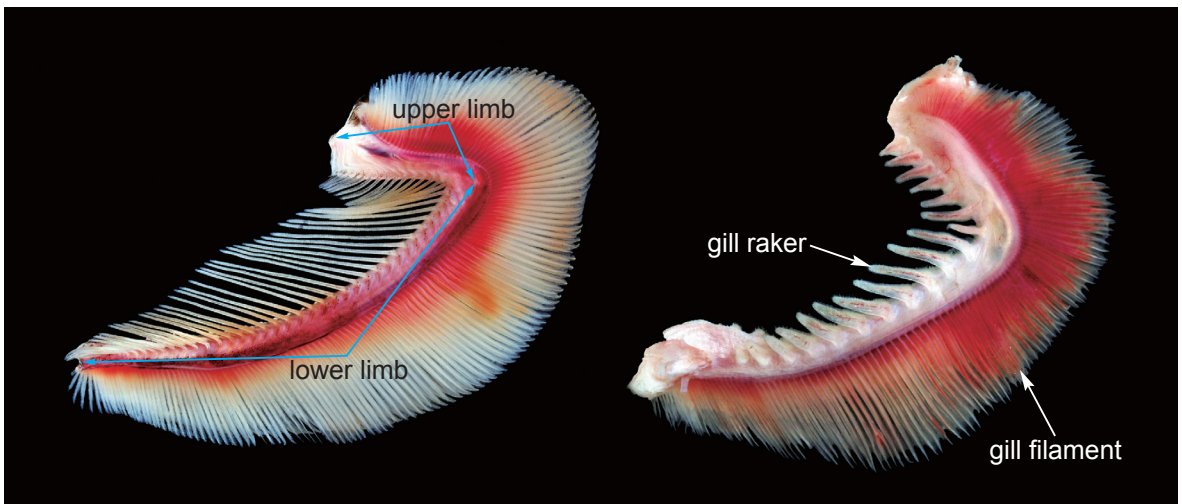
Body parts of elasmobranchs



Body parts of bony fish



Body parts of carangid



Gill arches of carangid (left) and sparid (right)

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